Uremic Lung: A Rare Entity in the Post Dialysis Era

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Introduction

Uremic pneumonitis, known as "uremic lung", is a complication of end stage renal disease. It rarely is seen these days in developed countries due to access to hemodialysis in patients with advanced renal failure.

Uremic pneumonitis is a clinical entity that was described as early as 1955.[1] Its pathophysiology is based on uremia-induced increased permeability of pulmonary alveolo-capillary interfaces, leading to interstitial and intra-alveolar edema, atelectasis, alveolar hemorrhage, and pulmonary hyaline membrane formation.[2] These changes are compounded by bleeding diathesis secondary to platelet dysfunction in advanced renal disease.[3] The pulmonary symptoms and radiographic findings are reversible with hemodialysis.

We describe the clinical presentation and management of a patient without prior history of kidney disease presenting with uremic pneumonitis.

Case Report

A 23-year-old Hispanic male with an uneventful past medical history presented with complaints of coughing up blood and epistaxis. Symptoms started two weeks prior with chest pain which worsened with breathing, lying on his back, and coughing. It progressed to a productive cough with hemoptysis of approximately one spoonful of bright red blood daily after about a week. He also reported infrequent self-limiting episodes of epistaxis.

The patient felt feverish. He had chills and sweats for one week. Other symptoms included shortness of breath on exertion, loss of appetite, fatigue, nausea, and a metallic taste in his mouth. He denied rash or arthralgias and reported normal urinary output.

He had moved to the United States from Mexico about four years prior and served as a delivery man for grocery stores for one and a half years, then as a construction worker for one year, and most recently had been mowing lawns for about a year. He previously smoked cigarettes and drank about six cans of beer daily until approximately two years prior to presentation. He denied use of illicit drugs. Family history was significant for his mother having hypertension.

On physical examination, the patient was afebrile. He had tachycardia, a respiratory rate of 24 bpm, an oxygen saturation of 97% on four liters by nasal cannula, and blood pressure of 154/90 mmHg. He had marked pallor, was in mild respiratory distress with hyperdynamic precordium, and coarse rales bilaterally on posterior chest auscultation. There was no jugular venous distension, pericardial friction rub, stupor, asterixis, or peripheral edema.

At presentation, his blood urea/nitrogen was markedly elevated at 218 mg/dl with serum creatinine of 41.5 mg/dl. His hematocrit was low with hemoglobin of 4.6 g/dl, and urinalysis showed 4+ proteins, 1+

blood, 2-10 white blood cells, 2-10 red blood cells, and urine protein/creatinine ratio of 11.4. There were no casts noted. An autoimmune work up was inconclusive. Blood counts and serum chemistry are listed in Tables 1 and 2.

Table 1. Serum chemistry at presentation and days 5 and 10 after initiation of dialysis.

Variable	Reference Range	On Evaluation	Day 5*	Day 10*
Sodium	137-147 mmol/L	129	134	139
Potassium	3.5-5.1 mmol/L	3.9	3.1	4.4
Chloride	98-110 mmol/L	93	97	104
CO2	21-30 mmol/L	9	21	27
Blood Urea Nitrogen	8-20 mg/dl	218	136	38
Creatinine	0.4-1.24 mg/dl	41.51	24.32	5.76
Anion Gap	8-12	27	16	8
eGFR	> 60 ml/min/1.73 m^2	1	2	13
Magnesium	1.6-2.6 mg/dl	3.2	2.1	2.6
Phosphorus	2.0-4.0 mg/dl	13.9	7.4	4.0

*After patient underwent hemodialysis.

Table 2. Basic hematological profile at presentation.

Variable	Reference Range	On Evaluation
Hematocrit	40-50%	13.4
Hemoglobin	13.5-16.5 g/dl	4.6
MCV	80-100 FL	83
WBC	4.5-11.0 K/UL	14.9
Platelet	15-400 K/UL	206
PTT	26.1-37.6 secs	31.9
INR	0.9-1.1	1.1

An initial chest X-ray showed symmetric bilateral air space opacities primarily involving the lower lung zones (Figure 1a). Non-contrast computed tomography (CT) of the chest showed diffuse and somewhat symmetric airspace opacities throughout the lungs bilaterally with a predominance in the lower lobes and relative sparing of the upper lobes and along the peripheral margins of the lungs (Figure 1b).

Upon admission, this patient received packed red blood cell transfusions and hemodialysis was initiated. The initial working diagnoses were pulmonary renal syndrome and lupus, but a comprehensive autoimmune work up was inconclusive.

Renal ultrasound showed atrophic bilateral kidneys. An echocardiogram was normal. Blood, sputum, and urine cultures remained negative for any growth. A renal biopsy showed changes suggestive of end stage renal disease and primarily an immunologically mediated glomerulo-nephritis producing a mesangio-proliferative and focally crescentic type of injury (Figure 2).

The patient's pulmonary symptoms and epistaxis resolved with repeated dialysis, as did radiographic evidence of alveolar infiltrates (Figure 3). This was more consistent with uremic pneumonitis rather than the pulmonary renal syndrome.

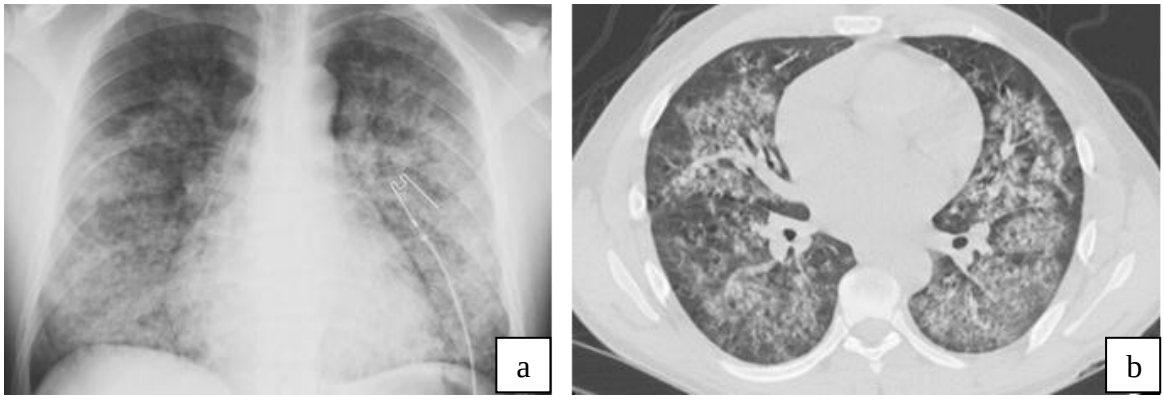

Figure 1. Initial chest x-ray (a) and non-contrast chest CT (b) images at presentation. There was extensive diffuse symmetric bilateral air space opacities primarily involving the lower lung zones characteristic of diffuse pulmonary hemorrhage.

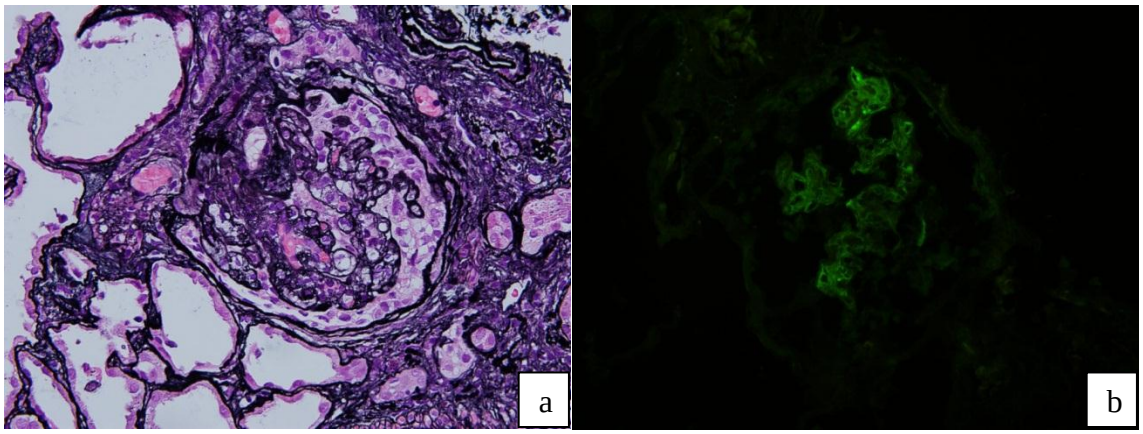

Figure 2. a) Renal biopsy showed a single glomerulus exhibiting a fibroepithelial crescent (periodic acid-Schiff-methenamine silver stain, 400x). b) Immunofluorescence stain demonstrated irregular deposits of C1q along the basement membrane of capillary loops and within mesangial areas (FITC anti-C1q, 400x).

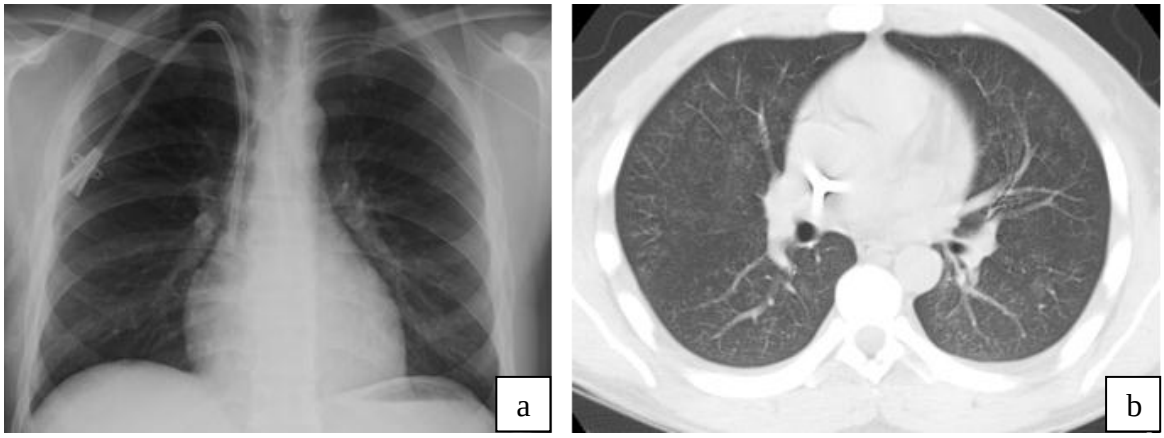

Figure 3. Follow-up chest x-ray (a) and non-contrast chest CT images (b) showed bilateral air space opacities largely resolved following hemodialysis.

Discussion

Uremic pneumonitis, common in the pre-dialysis era with frequent references in medical literature into the 1940s-1960s, is now rare in the developed world with improved recognition and care of renal disease and access to dialysis. Patients typically presented with dyspnea and characteristic and sometimes reversible radiological "butterfly densities" or "bats-wing shadows".[4,5]

This syndrome uniting pulmonary radiological features and uremia previously had been referred to by various names, including "pulmonary azotemia",[6] "pulmonary hyperemia with acidosis",[7] "uremic edema",[8] or "fluid lung".[9] It has been described in association with uremia secondary to severe glomerulonephritis and hemolytic-uremic syndrome, although it is believed to occur secondary to severe uremia from any etiology. Hughes[5] reported on a series of seven cases with characteristic radiographic changes several of which mirror the findings in our patient, including the resolution of opacities following dialysis, coupled with hemorrhagic changes in the lung, and "focal hemorrhages and alveolar albuminous and fibrinous edema".

Our patient neither had a prior diagnosis of renal dysfunction nor long-standing uremic symptoms. However, imaging studies and biopsy results indicated chronic kidney damage with evidence of glomerulonephritis and glomerulosclerosis, suggesting prior untreated or unrecognized renal disease.

In a case series of six patients presenting with pulmonary-renal syndrome without concomitant destructive pulmonary disease, Herman et al.[10] reported two patients with evidence of anti-glomerular basement membrane disease consistent with the Goodpasture Syndrome. Two had idiopathic rapidly progressive glomerulonephritis. One had immune complex deposition consistent with Systemic Lupus Erythematosus and one had vasculitic and immunologic changes consistent with Wegener's granulomatosis.

Our patient had a mesangio-proliferative and focal crescentic glomerulonephritis which likely produced end-stage kidney disease with severe uremia leading to pneumonitis. Severe complications from uremia are more likely to be encountered in patients with limited access to healthcare. Uremic pneumonitis can be protean in presentation and could be confused for other disease entities such as acute pulmonary edema, pneumonia, autoimmune, fungal or metastatic disease.[11] It is important for clinicians to consider this rare condition as part of their differential diagnosis for "butterfly lung" or "bats-wing shadows" in the setting of hemoptysis and renal failure.

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